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## AN ENTOMOLOGICAL MUDDLE: A REVIEW.

BY HENRY H. LYMAN, MONTREAL.

I fear that any one reading the various papers which have appeared during the past year on the *Cunea*-*Congrua*-*Antigone*-*Textor* controversy would not be very greatly impressed with the lucidity of entomologists. This controversy illustrates remarkably well the difficulty of carrying on a discussion about species or forms whose status is disputed without rendering confusion worse confounded, for the simple reason that different persons use the same name in different senses. For instance, when Dr. Fyles writes of *cunea*, Drury, he does not mean the insect which Drs. Smith and Dyar understand by the same name, the moth which Harris called the many-spotted ermine moth of the South, *Phalæna punctatissima*, A. & S., but the individual moth which served as Drury's type and which he chooses to believe did not belong to the genus *Hyphantria* at all, but to have been a *Spilosoma*, and from this springs much of the misunderstanding which has arisen between these gentlemen.

In such a case as this, one cannot be too careful to assume nothing and to avoid terms which may be misunderstood.

There are several questions in connection with these moths which require elucidation, one of which, and to my mind the most interesting, viz., whether *textor*, Harris, and *punctatissima*, A. & S., to use terms of which there can be no doubt, are, as generally believed, merely forms of one species, or, as believed by Harris, distinct species, has been very generally overlooked by these disputants.

In 1773, Drury described his *Bombyx cunea* in his "Illustrations of Exotic Entomology," while Abbot & Smith illustrated and described their *Phalæna punctatissima* in 1797. I have never seen the original edition of Drury, but possess the edition edited by Westwood in 1837, and have no reason to think that Drury's description was modified in any way in the editing.

The description is as follows :

"*Alis albis, anticis maculis permultis, posticis duabus nigris, abdomine concolori nigro-maculato.*"

"*Upper Side.*—Antennæ pectinated and black. There is no appearance of any tongue. Head white. Back and abdomen ash colour. Anterior wings white, with a great number of spots, differently shaped, of a sooty black colour. On the external margin are five spots, those nearest the tips being shaped like triangles. Posterior wings white, with a sooty spot on each near the external edge, and a very faint small mark near the exterior angle. *Under Side.*—Legs black. Breast and abdomen ash colour. The wings marked as on the upper side."

"Alar expanse 1 inch 5 lines." "Habitat: New York." The figure shows a moth of about  $35\frac{1}{2}$  mm. in alar expanse.

Abbott & Smith described their *Phalæna punctatissima* as follows :

"*Ph. Bombyx elinguis, alis deflexis corporeque niveis nigro punctatis, thorace utrinque lunula nigra.*"

*Phalæna cunea*, Drury, is cited as a synonym, and then they say :

"Whether this be the *cunea* of Mr. Drury or not, it deserves a more expressive, or, rather, less erroneous, name. The character above given applies to the male only, the female being entirely white."

Westwood, in editing the re-issue of Drury's plates, says of *cunea*, which he calls a *Spilosoma* : "There seems little reason for doubting that this is identical with the *Phalæna punctatissima* of Abbot & Smith, of which the female is entirely white. The name proposed by Drury evidently alludes to the triangular spots on the margin of the anterior wings, and seems quite as expressive as that employed by Sir J. E. Smith, who seems to have treated Drury's work on several occasions as scarcely deserving of notice."

No subsequent writer, so far as I am aware, has questioned the identity of *cunea*, Drury, and *punctatissima*, A. & S., except the Rev. Dr. Fyles.

In 1828, Harris described *Arctia textor* in the 7th Vol. of the *New*

*England Farmer*, and in 1841 erected the genus *Hyphantria* for it, also placing in it *punctatissima*, A. & S.

In 1855, Walker described his *Spilosoma congrua* as quoted by Dr. Fyles on page 99 of Vol. XXXI., CAN. ENT.

In 1856, Fitch described *H. punctata* in his 3rd Report on the Insects of New York, p. 387.

In Grote & Robinson's list of Bombycidae of 1868 they listed *Spilosoma virginica*, *congrua*, *vestalis*, and *Hyphantria textor*, *punctata*, *cunea*, with *punctatissima* as a synonym of *cunea*. Of *S. congrua*, these gentlemen wrote in Trans. Amer. Ent. Soc., II., 72 (1868), as follows:

"*Spilosoma congrua*, Walk., (c) = ♀ *Spil. virginica* (Fab.), Walk. Specimens a and b appear to belong to a species distinct from *S. virginica*, which should retain the name proposed by Mr. Walker. Our notes on these two specimens are as follows: '*S. congrua* (♂). Primaries white, with sparse brown dots and an S-shaped subterminal brown line, all incomplete. Abdomen entirely white. Faint discal marks on both wings, wanting in the female. Primaries (♀) with but one or two dots, almost immaculate. Secondaries immaculate in either sex. Inwardly the fore coxae and femora are dark yellow, without the black spot of *S. virginica*. All the tarsi and fore tibiae are inwardly brown. The ♂ has faint discal marks on both wings, wanting in ♀. This species seems slighter than *S. virginica*, and approaches *Hyphantria cunea* in the markings of the primaries, but is stouter than that species, the palpi and antennae as in *Spilosoma*.'"

What these authors meant by an "S-shaped subterminal brown line" I do not know, as I never saw a specimen of *antigone* so decorated.

But in Grote's Check List of 1882 this species was not included, the *Spilosomas* named being *virginica*, *vestalis* and *latipennis*, and the *Hyphantrias*, the same as in the list of 1868, but in a different order, *cunea* and *textor*, however, being still recognized as distinct. But a few months after this list appeared, Mr. Grote proclaimed the discovery of *S. congrua*, Mr. Thaxter having reared it from the larva, and conjectured that it was "very likely" the same as the form which Mr. Strecker had named *antigone*. (CAN. ENT., XV., 9, Jan., 1883.)

In the April, 1889, number of *Entomologica Americana*, Mrs. Slosson described her *Spilosoma prima*.

In June, 1889, Mr. J. B. Smith published a note on *Spilosoma congrua*, Walk., in *Ent. Amer.*, V., 119, arguing that Walker's description

of *congrua* did not fit *S. antigone*, Strecker, but did fit *H. cunea*, Drury, presuming the latter to be the same as *punctatissima*, A. & S., and quoting a note of Mr. A. G. Butler's, written in 1875, to the effect that the only specimens then representing *congrua* in the British Museum collection were a presumably female specimen of *S. virginica*, without abdomen, and what he "believed to be" a male "variety" of *H. cunea*.

With all due respect to these authorities, I do not place any great weight upon conjectures that something is "very likely" the same as something else, or upon a "belief" that one moth is a variety of another, and it is hardly creditable to the custodians of collections in a great national museum which are not open to the public that types can be lost or destroyed.

In 1890, Mr. J. B. Smith again dealt with these forms in his "Preliminary Catalogue of the Arctiidae of Temperate North America," in the CANADIAN ENTOMOLOGIST, but, through an error of the printer, overlooked by the proofreader, all the names, whether recognized as good species or only as synonyms, were treated alike and stand apparently as species. (CAN. ENT., XXII., 161-165.)

In 1891, Dr. Smith issued his "List of the Lepidoptera of Boreal America," and in it listed the *Spilosomas* as *virginica*, *prima*, *vestalis*, *latipennis* and *antigone*, with *congrua* ‡, Grote, as a synonym; and under *Hyphantria* placed *cunea*, Drury; with *punctatissima*, S. & A.; *punctata*, Fitch; *congrua*, Walk.; *textor*, Harr.; *candida*, Walk., and *ab. pallida*, Pack., as synonyms, the last being an aberrant form which Dr. Packard had described in 1864 under the name of *Arctia pallida*, in his "Synopsis of the Bombycidae of the United States." (Proc. Ent. Soc. Phil., III., 118.)

This, then, was the condition of affairs when Dr. Fyles obtained the eggs of *antigone* in June, 1897, and a specimen of a much-spotted moth of the genus *Spilosoma* in the Gomin Swamp, and at the annual meeting in the following autumn read a paper under the title of "An Arctian—What is it?"

This paper was never published, but in the CANADIAN ENTOMOLOGIST for May, 1899, appeared a paper by the same author, entitled "Observations upon *Spilosoma congrua*, Walker," in which Dr. Fyles gave an account of his rearing of these larvæ and described the variation among the imagoes and identified them with Walker's species. Of the much-spotted moth taken at the same time as the parent of the larvæ, he said that it "presented the exact appearance of the insect which is figured,

with closed wings, in the original edition of Drury's work and named by him *Bombyx cunea*."

This, of course, was an error, as Drury's figure has the wings fully expanded both in the original edition and in that edited by Westwood, which was printed from the original plates.

Dr. Fyles's identification of the moths reared by him with the *congrua* of Walker may be correct, but it would be much more satisfactory if Walker's types were forthcoming; but his treatment of the webworm moths is not satisfactory.

Referring to the many-spotted ermine moth of the South, he says that its most spotted form is supposed to have been the *Bombyx cunea* of Drury, and that therefore it is said that the name of the variety must take the place of the name given by Harris, and till very lately generally accepted.

Now, the question as to whether the name *textor* should stand depends upon a number of questions: first, upon whether the immaculate form of the North is, or is not, specifically distinct from the spotted form of the South; and, second, upon whether the authorities are, or are not, correct in identifying it with the *budea* of Hübner; and Dr. Fyles apparently overlooked the fact that even if *cunea*, Drury, could be shown not to have been described from a southern webworm, the name *punctatissima*, A. & S., has priority of *textor*, if the two forms belong to the same species. Dr. Fyles, comparing the illustration of the webworm moth as figured by Dr. Riley with the figure given by Dr. Bethune in CAN. ENT., V., 141, instead of laying the blame for the absurd size of Riley's figure upon the incorrect drawing by the artist, apparently accused that eminent entomologist of confusing *antigone* and *punctatissima*, as he says: "Riley's cut represents an insect 20 lines in expanse of wings (it really shows one nearly 22 lines when measurement is made from centre of thorax to tip of each wing). I venture to say that no fall webworm moth ever attained such a size. But latitude was necessary to take in such moths as *congrua* and *cunea*." (The latter name apparently used in the Fyles sense, not that of authorities generally.) And a few lines further down, referring to the series of wings shown by Riley, says triumphantly in italics: "*There is not one of them but can be exactly matched from insects I raised, or that were taken with the mother insect in the Gomin.*"

If these sentences do not imply that Dr. Riley confused two or three species of moths, I cannot see that they imply anything.

Following Dr. Fyles's paper, appeared in the June CANADIAN ENTOMOLOGIST a paper by Dr. Dyar in which he admitted that Dr. Fyles was probably right in identifying antigone, Strecker, with congrua, Walker, but he stumbled in regard to Dr. Fyles's meaning about cunea, understanding it as equivalent to punctatissima.

In the July number, Dr. Smith dwelt on the probability of Mr. Walker having before him three banded specimens of punctatissima, and the improbability of his having three banded antigone from Georgia, and these arguments are of considerable weight, though naturally not conclusive, and, indeed, not intended to be so by the author.

To the September number, Mr. Grote contributed a page on this controversy, without adding any information of value, but showing that he has apparently forgotten that there were two species under the name congrua in 1867, the third specimen (c) being *S. virginica* ♀ according to G. & R.

In the December number there were no less than two papers upon this controversy. The first, by Dr. Ottolengui, affords some interesting information in regard to the distribution of *S. antigone* and also as to much-spotted specimens of punctatissima occurring in the spring brood in the South, but it would appear that he also stumbled in regard to supposing that Dr. Fyles meant punctatissima by the name cunea.

Dr. Ottolengui's theory in regard to the type of pattern in all species is ingenious and there may be some truth in it, but his illustration of it in the case of antigone is of no weight at all, as the dot or spot "at the second fork of the median nerve" as described by Dr. Fyles is not confined to *S. antigone*, but also occurs in *S. virginica*, *S. vestalis*, *H. punctatissima*, and *Leucarctia acraea*.

Again, in saying that this spot "is not a constant feature of Prof. Riley's series (Forest Insects, p. 246, fig. 87), if, indeed, it occurs at all exactly as it does in *congrua*," he is laying altogether too much stress on the supposed infallibility of the artist. No artist is infallible, and slight errors can be detected in almost every figure not taken by photography.

As to his aberrant specimens from Summerville, S. C., I sincerely hope he will not erect a new species in so variable a genus on such slender material, as I have a ♂ *S. virginica* taken *in coitu* with a normal ♀ which varies in a somewhat similar manner, the outer third of costa



and the outer portion of the nervures of the primaries about the apical portion being blackish, which makes it look as if slightly scorched at the tips as described by the Doctor. Dr. Ottolengui expresses his conviction that *congrua* is distinct from *cunea*, but this was surely unnecessary, and shows that he misunderstood Dr. Fyles's meaning, as no one has suggested that the ground-feeding *S. antigone* is identical with the tree-feeding *H. punctatissima*.

In the same number Dr. Fyles had a second paper upon the same tangled question.

Dr. Fyles derives the name *cunea* from the Greek *κυνέη* (a dog's skin), from a supposed fancied resemblance in coloration to the spotted carriage-dog of Europe, but I think Mr. Westwood's derivation from the Latin *cuneus* (a wedge) quite as probable, Drury having especially referred to the triangular marks. Dr. Fyles draws attention to the fact that the hind tibiae are not shown in Drury's figure, and that Walker did not describe the hind tibiae of what he supposed to be *cunea* or of what he described as *congrua*, but these points are of very minor importance, especially as in Drury's day entomological artists were not so particular about a spine or so, more or less, on the legs of insects.

Dr. Fyles says, in regard to *cunea*, that "we have nothing to guide us except Drury's figure, and Walker's description."

This is a very extraordinary statement, as we have Drury's description as well as figure; but how Walker's description of a few specimens of moths which he supposed to be identical with Drury's *cunea* could have any weight in deciding what Drury's moth really was, I fail to see.

Dr. Fyles, however, does not lay much stress on Walker's description of *supposed* *cunea*, but falls back on Drury's figure and finds it sufficient. I am not at all surprised at that, as I think that practically everybody else finds it sufficient also, as I believe that until Dr. Fyles became guilty of his present heresy, the belief that Drury's figure of *cunea* represented the much-spotted ermine moth of the South was one of those doctrines to which the formula "*semper, ubique et ab omnibus*" could be applied.

Dr. Fyles lays great stress on the fact that not one of the eight figures given by Riley to illustrate the supposed variation of *cunea* agrees exactly with Drury's figure, but this is really of no significance, as Riley was not trying to match that figure at all, but merely to show the range of variation, and in the case of so variable a species it might be possible to give a hundred figures and yet not have two exactly alike.

In Dr. Fyles's concluding remarks on *congrua*, he says :

(c) Dr. Hulst and others have bred it.

(d) *S. antigone* has been found to be identical with it.

These statements are too positive to be scientific. Dr. Hulst and others have bred *antigone*, and it seems probable that that species is the same as *congrua*, but that is all we can say at present.

In the January number of the present year Dr. Dyar very briefly points out Dr. Fyles's error, calling attention to the fact that of *cunea* the abdomen is described as "*concolori nigro-maculato*," the English description saying "back and abdomen ash colour." Drury's figure shows a white abdomen, while the abdomen of Dr. Fyles's specimen is yellow. Dr. Dyar pronounces this much-spotted *Spilosoma* to be *prima*, Slosson, and Mr. Beutenmuller thought last June that Mr. Winn's specimen of the same species which I showed him was possibly that species, but if so, either Mrs. Slosson's types must have been aberrant or she laid too much stress on the "cream-colour, almost buff" tone of the moth, as in these specimens the only yellowish tone is on the nervures.

I entirely disagree with Dr. Fyles, as I can see no resemblance, beyond the most superficial, between his specimen and Drury's figure, while I have a specimen of *H. punctatissima* from New Jersey which is practically identical with the figure of *cunea*.

I am, as mentioned by Dr. Dyar, at work upon the question of the relationship existing between *punctatissima* and *textor*, but am not in a position to make any report as yet.

NOTE.—Since writing the above, Dr. Fyles has published another paper upon this matter in the March number of the CANADIAN ENTOMOLOGIST, and in this has made plain what had better have been pointed out at first, that by *cunea* he merely referred to Drury's type and not to the species which has since been known by that name, but he falls into other errors.

He is wrong in implying that Dr. Ottolengui doubted the identity of *cunea*, Drury, and *punctatissima*, A. & S.

What Dr. Ottolengui expressed a doubt about was whether *textor*, Harris, and *punctatissima*, A. & S., were the same.

Abbot's figures of *punctatissima* ♂ and ♀ are admirable. What does Dr. Fyles mean by "an irregularly spotted insect?" The figure shows perfect bilateral symmetry. The figure of the larva is poor, but no worse than hundreds of other figures which have been made of larvæ.



Dr. Fyles calls Abbot's plate "quite a fancy sketch!"—presumably because the larva is represented as feeding on the mulberry, but I have no doubt it does, it is such a general feeder,—almost universal, Dr. Howard says.

Dr. Fyles's reference to Walker's description of what he took to be *cunea*, and what was doubtless *punctatissima*, is without weight, as I have mentioned above.

Drury only figured and described the ♂ of *cunea*.

Dr. Fyles seems to measure the expanse of moths from tip to tip as set according to the present fashion. This is misleading, and the measurement should be taken from the tip of wing to centre of thorax and doubled.

Dr. Fyles certainly sticks to his guns with a tenacity not surpassed by the Boers in the Transvaal, and asserts that even if his Gomin specimen is *prima*, Slosson, it only proves that the latter is a synonym of *cunea*, Drury!

Dr. Fyles sums up the matter by stating that he is convinced that *Hyphantria textor*, Harris, is not one and the same with *Bombyx cunea*, Drury, and in this I am inclined to agree with him, but surely such a statement was unnecessary after declaring *Bombyx cunea*, Drury, to be a *Spilosoma*.

#### FOUR NEW COCCIDÆ FROM ARIZONA.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

##### *Dactylopius Irishi*, sp. n.

♀.—Adult dark red, forming a very convex chalk-white ovisac about 3 millim. long and  $2\frac{1}{2}$  high, the sacs clustered on the twigs of the plant at the nodes, from two to ten at a node. Eggs and newly-hatched larvæ pale yellow.

Adult ♀, after being boiled and flattened on a slide, nearly circular, about 2 mm. long. The insects do not stain the liquor potassæ on boiling, but the body contains a dull crimson pigment, partly retained in boiled specimens.

Skin with many small round glands, which in lateral view look like truncate spines. Dermal hairs very few and small. No lateral patches of spines. Caudal lobes completely obsolete, marked only by a pair of short stout spines on each side. Hairs on anal ring comparatively short

and inconspicuous, much shorter than in *D. Townsendi*. Legs and antennæ pale yellowish.

Middle leg measuring about as follows in  $\mu$ : Coxa, 111; femur with trochanter, 231; tibia, 180; tarsus, 90; claw, 30; width of femur, 57. Antennæ 8-jointed, the joints measuring in  $\mu$ : (1.) 45-51, (2.) 36-40, (3.) 33-42, (4.) 18-27, (5.) 25-27, (6.) 16-24, (7.) 27, (8.) 69-78. Formula varying from 8132(47)56 to 8123(57)46.

*Hab.*—Tempe, Arizona: Numerous on the butte, on *Larrea tridentata*, Oct. 28, 1899. (*Ckll.*) This interesting species is named after Mr. Fred. M. Irish, of the Arizona Normal School, who was with me at the time of its discovery. *D. Irishi* is closely related to *D. Steeli*, which infests the same plant in New Mexico, but it is readily distinguished by its much more convex ovisac, and its habit of clustering on the twigs at the nodes, instead of living on the leaves. In the latter respect the insect resembles *D. prosopidis*. In the most advanced state the ♀ is very nearly, but not entirely, covered by the ovisac.

*Aspidiotus (Hemiberlesia) candidulus*, sp. n.

♀.—Differs thus from *A. lataniae*: Anal orifice smaller, about as big as one of the median lobes; width of anal orifice about 12  $\mu$ ; median lobes not or barely notched; nine squames, close together and little branched, on each side of the median lobes; inner chitinous processes of interlobular intervals conspicuously larger than the outer; spines (hairs) long, even exceeding the squames; four groups of circumgenital glands, posterior laterals 4 to 5, anterior laterals 4; margin of insect with very long bristles at distant intervals; embryos in ♀ very large, about 210  $\mu$  long; median lobes of embryo twice notched on outer side.

♂.—Scale white with a yellowish tinge, only slightly convex, exuviae sublateral, varying from pale straw-colour to ferruginous brown. ♂ scale elongate-oval, white, with the pale straw-coloured exposed exuvia near one end.

*Hab.*—Tucson, Arizona, just behind the University; locally abundant on leaves and twigs of *Prosopis velutina*, along with plenty of *Xerophilaspis prosopidis*. Collected in November, 1899, by the writer, in company with Prof. Toumey. The ♂ scales are much more abundant than the ♀; when originally describing *X. prosopidis* (Suppt. to Psyche, Dec., 1895) I had some of these ♂ scales, and regarded them as belonging to the *Xerophilaspis*.

*Xerophilaspis Parkinsoniæ*, sp. n.

♀.—Scale small, about 1 millim. diam.; exuviae large, dark brown to black; first skin large, placed on second; second more or less covered by a white film; scale suboval, white, thin; the part of the scale beyond the exuviae is anteriorly much less than the diameter of the latter, posteriorly somewhat greater, the exuviae being excentric.

♂.—Scale oval, white; exuvia towards one end, brown, with a pale median line.

♀.—(Mounted on slide) About  $700\ \mu$  long; spines moderately large; squames scarcely visible; caudal end striated; no circumgenital glands; anal orifice long and narrow, about  $10\ \mu$  long and  $39\ \mu$  from base of median lobes; median lobes rather large, about  $12\ \mu$  long, close together but not contiguous, broad, rounded at ends, with a deep square notch on the outer side; second lobes smaller, separated from the first by a fair interval, pointed, notched on the outer side; third lobes rudimentary; dorsal glands few; interlobular chitinous processes present, but very small: they are beneath the lobes rather than between them; a submarginal row of elongate glands, such as are seen in *Chionaspis*; anterior part of insect brown even after prolonged boiling; antennæ represented by large low-conical protuberances; embryo in ♀ very large, about  $186\ \mu$  long, with dark eyes.

*Hab.*—Phoenix, Arizona, Oct. 23, 1899; on twigs and branches of *Parkinsonia torreyana*. The *Parkinsonia*, or "palo verde," is common around Phoenix, and I expected to find a coccid peculiar to it, but for many days my search was fruitless. At last I saw, one day, a tree with the branches on one side turned yellow, and on going up to it, found the above-described insect in great numbers. With the scales I found a small form of *Chilocorus cacti* predaceous upon them. *X. Parkinsoniæ* is not a true *Xerophilaspis*, nor yet a satisfactory *Targionia*. It differs from typical *Xerophilaspis* in the development of the white scale, and the position of the anal orifice; but it agrees sufficiently in the form of the exuviae, the large embryo, etc.

*Diaspis Arizonicus*, sp. n.

♀.—Scale, dull white, more or less circular, but very irregular because crowded into the cracks in the bark; a thick ventral scale; exuviae very inconspicuous, yellowish-white, or first skin sometimes brown; first skin with its anterior end extending beyond margin of second.

♂.—Scale flat, firm (not at all woolly), dull white, parallel-sided, about  $\frac{3}{4}$  mm. long and not quite half as wide.

♀.—Adult dark brown even after boiling in liquor potassæ, strongly chitinized, spiracles large and conspicuous; segmentation visible; caudal area brown and chitinized, except its basal portion, anterior to the anal orifice, which is transparent and colourless. The non-chitinized area at the base of the caudal plate permits the latter to be withdrawn almost wholly into the body, leaving the tip only protruding. No circumgenital glands. Caudal area very much wrinkled, with many round to oval dorsal glands, arranged more or less in transverse rows, and also rather numerous scattered small ventral glands. Anal orifice rather small, a long distance from hind end. Caudal margin strongly crenate; three larger protuberances, more or less emarginate at the ends, may be taken to represent the lobes; between the median lobes, instead of two squames, are two lobules; between the first and second lobes are two or three lobules; between the second and third are three to five lobules. No squames, but laterad of each lobe is a very long spine; two spines laterad of the median lobes.

♀.—Second stage not so chitinous, transparent after boiling; mouth-parts far posterior; antennæ represented by very large subconical protuberances.

*Hab.*—On trunks and branches of *Prosopis velutina*, Wooton, near Kellner's Ranch, several miles west of Phoenix, Arizona; Oct. 11, 1899. (*Ckl.*) *Xerophilaspis prosopidis* occurred on the same trees at the same place.

*D. Arizonicus* is remote enough from typical *Diaspis*, but by reason of the median interlobular structure, and the arrangement of the dorsal glands, it approaches nearer to the subg. *Epidiaspis* (type *D. piricola*). It is probable that it will later be made the type of a new subgenus.

#### A SALE OF BUTTERFLIES.

Entomologists went from all parts of the country when the celebrated collection of butterflies and moths made by the late Samuel Stevens, F.L.S., F.E.S., was sold. Mr. Stevens had continued his work of collecting, breeding, and buying for 60 years, and many specimens were already historic, having come from other noted collections. The "large copper" butterfly, long since become extinct, always attracts bidders, but £8 given for an exceptionally fine male creates a record, and even for one of the females £6 5s. was bid. A specimen of the common "painted lady" also fetched £8, while another of the same species cost its buyer £6 10s. A handsome "red admiral," which is perhaps nearly as often seen as the "small tortoiseshell," was sold for £5 10s., while a "peacock" with 20 "eyes" on its wings went for £5.—*London, England, Globe* (March 29, 1900).

## HYDRÆCIA STRAMENTOSA.

SIR,—I am in receipt of a communication from A. Radcliffe Grote, M. A., Hildesheim, Germany, anent the determination of *Hydræcia stramentosa* for Canadian collectors. He points out to me that the fact of its being under *Apamea* in our list indicates the source from whence the name was obtained, as he was the only author that ever used that generic term for the group to which *stramentosa* belongs, proving that he knew of its being taken in Canada, having received specimens from collectors there to name; which is more than likely, as Mr. Grote was at that time the recognized authority on North American *Noctuidæ*.

The original Canadian collection was brought together from various sources to be exhibited at the "Centennial" in Philadelphia, 1876. Some material for it came from the Province of Quebec, which would be largely from Montreal collectors; and this collection was reviewed by Mr. Grote before it was dispatched on its mission. From exposure at Philadelphia and the Colonial and Indian Exhibition in London, England, 1886, what was left of it had mostly become worthless for comparison, and it was necessary to replace it as far as possible with fresh specimens. There is no evidence that there ever had been a specimen of *Stramentosa* in the original collection; if there was, it must have been returned to its owner. Other specimens, bleached beyond recognition, are yet in the collection—from want of fresh material to replace them; so I reason, that if there had been a specimen of *stramentosa* left in the collection, it would be there still. If such an one is extant, it will likely be found in some Montreal collection.

I have often thought when doubts were expressed about the correct determination of some specimen, that a label with the name of the determinator was of the very first importance to indicate in some measure its reliability. My Hamilton collection was largely determined for me by Mr. Grote, then living in Buffalo, and as I kept his lists for future reference, when doubt arose I could turn them up and feel that these particular specimens at least were correct beyond question. But time and *Anthrenus* worked havoc with some of the original specimens, which reduced the value of the lists, as the specimens replacing them were only my estimate of what were the same.

J. ALSTON MOFFAT,  
Curator Ent. Soc. of Ont.

## A DECADE OF DOLICHOPODIDÆ.\*

BY AXEL LEONARD MELANDER, AUSTIN, TEXAS.

The ten species included in the present paper are all from the collection of Dr. Wm. M. Wheeler, under whose management this work was performed. As a slight token of my appreciation of his generosity and kindness, it pleases me greatly to dedicate one of the forms to him.

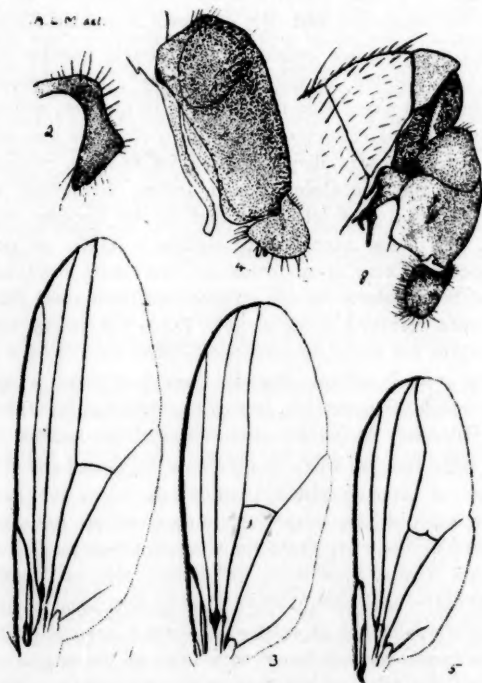


FIG. 9.

\*Contributions from the Zoological Laboratory of the University of Texas, No. 2.



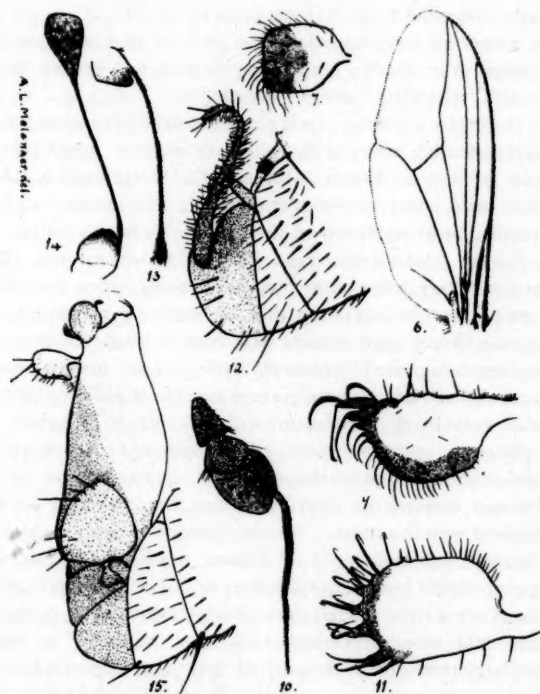


FIG. 10.

## EXPLANATION OF FIGURES 9 AND 10.

1. *Hercostomus vetitus*, male wing.
2. *Hercostomus vetitus*, lamella of hypopygium.
3. *Hercostomus anarmostus*, male wing.
4. *Paraclius hybridus*, hypopygium.
5. *Paraclius hybridus*, male wing.
6. *Tachytrechus protervus*, female wing.
7. *Tachytrechus protervus*, lamella.
8. *Tachytrechus volitans*, hypopygium.
9. *Dolichopus sincerus*, lamella.
10. *Dolichopus sincerus*, male antenna, from inside.
11. *Dolichopus misellus*, lamella.
12. *Nematoproctus venustus*, hypopygium.
13. *Gymnopternus mirificus*, male antenna.
14. *Gymnopternus phyllophorus*, Lw., male antenna.
15. *Pelastoneurus Wheelerii*, hypopygium.

1. *Dolichopus sincerus*, n. sp. (Figs. 9, 10.)

Legs, except all the coxæ, hind tarsi and tip of hind tibiæ, yellow; cilia of inferior orbit black; fourth longitudinal not broken, but bent; antennæ black; legs plain; wings unspotted.

*Male*.—Length 4.5 mm., of wing 4 mm. Bright brassy-green. Face narrow, silvery-dusted, with a slight yellowish tinge on upper part, under the antennæ a little darkened. Palpi dark, silvery-dusted. Antennæ wholly black, third joint broadly ovate; arista a little longer than antenna, stout, tapering, not evidently pubescent. Vertex shining brassy-green, not dusted. Infra-ocular cilia pale yellow, not strong. Thoracic dorsum bright brassy-green, more cupreous along sides and with two cupreous stripes in front bounding the rather strong acrostichals. The velvety and the silvery spots present near base of wing. Abdomen shining, green, becoming more cupreous, then piceous towards incisures. Hypopygium with the lamellæ moderate in size, the lamellæ sub-triangular, whitish with wide black border and ordinary fringe of hairs. Pleura greenish, glaucous, and in various places with a cupreous reflection. Coxæ concolorous with the pleura, except at very tips; fore coxæ with black hairs and bristles on anterior surface; middle coxæ with white hairs intermixed with the black. Femora reddish yellow, slightly darker on upper surface, especially on hind femora toward tip; posterior four with a single preapical bristle; hind femora not ciliated beneath, although the small hairs are a trifle longer than usual; tibiæ yellow, except outer sixth of hind ones, where the black encloses a "dimple" on the outer side; tarsi plain, anterior four from tip of first joint and whole of hind tarsi black; pulvilli pale yellow, small. Wings grayish-hyaline, broad; costa elongate, thickened at tip of first vein; fourth vein with usual flexure; posterior cross-vein perpendicular to first segment of fifth vein and distant about three times its own length from tip of fifth; hind margin with rather evident fringing. Tegulæ and halteres yellow; tegular cilia black.

One male, collected by Dr. Wm. M. Wheeler, in Price County, Wisconsin, August 19, 1897.

Differs from *praustus* by the face being more silvery, vertex shining, fore femora not darker beneath, wings not blackened at tip, and the fourth longitudinal distinctly bent.

2. *Dolichopus misellus*, n. sp. (Fig. 11.)

Femora yellow, hind ones not ciliated; cilia of inferior orbit pale;

cilia of tegulae black; wings unspotted, fourth longitudinal not broken; hind tibiae tipped with brown; antennae black, red below on first joint; fore coxae reddish in front; fore legs plain; vertex violet-bronzed.

*Male*.—Length 5 mm., length of wing 4.5 mm. Face and palpi yellowish white. Antennae lengthened, the joints subequal in length, black; first joint reddish below, third with the arista preapical, a little longer than antennae. Vertex violaceous with a cupreous tinge. Infra-ocular cilia pale yellow. Dorsum of thorax and scutellum bronzed-green, shining, not dusted. Abdomen strongly compressed, bronzed-green, shining, slightly dusted, incisures not well marked. Hypopygium not large, lamellae rounded apically, yellowish-tinged, narrowly black-bordered, and fringed. Pleura dark green, dusted, yet shining in places; the place of the usual velvety-black antealar spot is taken by a Y-shaped cupreous groove. Bases of middle and hind coxae and posterior face of front coxae piceous, glaucous; the anterior face of the front coxae is dark yellow, sharply limited, without the usual coating of black hairs, but with three of the strong apical ones and a few pale hairs. Femora yellow, the hind ones not ciliated and with a single anteapical bristle; tibiae yellow, except the hind ones at tip on inner side, an elongate apical "dimple" and a narrow glabrous streak on the posterior face of hind tibiae, the dimple nearer the outside; tarsi plain, blackened from tip of first joint (hind ones missing in male); pulvilli whitish. Wings grayish-hyaline; veins not black; fourth vein obtusely, but sharply, bent; posterior cross-vein distant less than twice its length from tip of fifth; costa with a small, lengthened, node-like swelling beyond junction with first vein. Tegulae and halteres light yellow, the former with very long black cilia.

The female differs from the male by the broader, grayer face; greener front; shorter tegular cilia; no costal node nor impression in hind tibia; front face of fore coxae with black hairs. Hind metatarsus with basal two-thirds yellowish.

One male and one female from Natrona Co., August 31, 1895, and one female from Little Wind River, September 2, 1895, Wyoming; collected by Dr. Wm. M. Wheeler.

From the only species with which this could be confounded in any way (*setosus*, *platyprosopus*, *praustus*, *fulvipes* and *Coquilletti*) this species may be readily distinguished by the first short diagnosis.

3. *Gymnopternus mirificus*, n. sp. (Fig. 13.)

Very similar to *G. phyllophorus*, Loew, from which it differs by the

following characters only: Face less ochraceous, more gray; third joint of antennæ more oval, its arista slightly pubescent, terminating in a very small lamella; the hypopygium is scarcely a third the length of that of *phyllophorus*, though this is due in part to shrinking.

One male specimen; collected by Dr. Garry de N. Hough in Massachusetts.

*Hercostomus* has always been an incongruous genus, formed of species rejected from several genera. The next two species differ from all the genera of *Dolichopodidae* as now understood, but as they show evident affinity to the species of *Hercostomus*, they may be placed, at least provisionally, in that genus. The structure of the male hypopygium, the curvature in the third vein and the presence of oral bristles show a departure, more or less marked, from *Gymnopternus*. The following key is wholly artificial, but readily separates the species hitherto included in this much-abused genus:

- Legs largely yellow ..... 2.
- Legs largely black ..... 5.
- 2. Post-ocular cilia black ..... 3.
- Post-ocular cilia pale ..... 4.
- 3. Face ochraceous..... *procerus*, Wheeler.
- Face dark ..... *vetitus*, n. sp.
- 4. Antennæ yellow..... *latipes*, Aldrich.
- Antennæ black..... *impudicus*, Wheeler.
- 5. Legs and lamellæ piceous..... *unicolor*, Loew.

(Synonym *Gymnopternus pænitens*, Wheeler.)

Legs and lamellæ fuscous..... *anarmostus*, n. sp.

4. *Hercostomus vetitus*, n. sp. (Fig. 1, 2.)

*Male*.—Length 4.5 mm., of wing 4.5 mm. Face of moderate width, brownish. Palpi piceous, proboscis fuscous, surrounded with a fringe of bristles. Antennæ short, black, second and third joints together rounded obtusely pointed at tip, with a dorsal, short, gradually tapering, pubescent arista. Vertex dark greenish. Post-ocular cilia black; post-oral beard wanting. Dorsum of thorax dark blue-green, more shining posteriorly, scutellum blue-green, with surface hairy. Abdomen shining, dark blue-green, becoming slightly cupreous towards apex, incisures not darkened. Hypopygium large, sessile, piceous, slightly pubescent dorsally, the dorsal cardiform plate bristly; internal appendages reddish; lamellæ fuscous,

darker towards tip, slender, not lamelliform, fringed with black hairs outwardly and at apex, at basal third a sudden swelling, then of regular width to the triangular clavate apex. Venter concolorous with the rest of the abdomen. Pleura piceous, glaucous. Coxæ more or less darkened, except at tips; fore coxæ less blackened on anterior and posterior surfaces, with short, black hairs besides the long apical bristles; middle coxæ with usual apical brush of hairs. Legs yellow, slightly infuscated towards tip of tarsi; first joint of fore tarsi in length equal to the three following together, of the middle tarsi the first joint equals the next two and half of the third following joints, the hind metatarsus is shorter than the joint next following; posterior femora with a single apical bristle. Wings subhyaline, third vein slightly and gradually converging towards the fourth; anal angle rounded; posterior cross-vein perpendicular to proximal segment of the fourth vein. Tegular cilia black, tegulæ and halteres yellow.

One male, from Clementon, N. J.; collected by Mr. C. W. Johnson, May 30, 1897.

5. *Hercostratus anarmostus*, n. sp. (Fig. 3.)

*Male*.—Length 3.5 mm., length of wing 3.25 mm. Face rather broad, gray-dusted. Palpi and proboscis piceous. Antennæ black, third joint lengthened, flat above, rounded below, rather acutely pointed, bearing the dorsal arista. Vertex dark greenish, opaque. Post-ocular bristles black. No beard present. Thorax shining, dark green, with usual bristles. Scutellum concolorous, sparsely bristly, and with a marginal row of a few short bristles in addition to usual two. Abdomen green, somewhat brassy, incisures not darkened. Hypopygium piceous, pubescent, its cardiform plate bristly; internal appendages lengthened, reddish; penis pointed; lamellæ infuscated, crescent-shaped, much thickened at middle and evenly attenuated to the tip, covered and fringed externally with short black hairs, apex narrowly but distinctly margined with black. Pleura and coxæ, except tips, green, overlaid with glaucous. Front coxæ with black hairs anteriorly; middle coxæ with fewer hairs than usual. Legs infuscated, especially on upper side of all the femora, tip of hind tibiae, and fore tarsi from tip of first joint; middle tarsi from apex of first joint black. Metatarsus of fore legs a little shorter than three following joints, of middle equal to two following, of hind legs shorter than next joint and with a few short bristles below. Wings subhyaline, slightly tinged with yellow anterior to third vein and bordering each vein;

veins strong, black, a thickening in the first vein where it reaches the costa; third and fourth veins subparallel, the fourth vein ends slightly before the tip; posterior cross-vein bowed outwardly, perpendicular to the last segment of the fourth vein, a slight lobe under the posterior cross-vein; anal angle full, rounded. Halteres and tegulæ yellow; tegular cilia black.

One specimen; Chicago, Illinois, June 10, 1899; collected by Dr. Wm. M. Wheeler.

6. *Pelastoneurus Wheelerii*, n. sp. (Fig. 15.)

*Male*.—Length 3.75 mm., of wing 3 mm. Face of moderate width, narrowest in middle, green, thickly overlaid with silvery dust, becoming yellow toward antennæ. Proboscis piceous, palpi silvery, with a few hairs. Antennæ wholly reddish-yellow, slightly subfuscated at apex; third joint short, ovate, bluntly pointed, arista short, tapering, with strong plumosity. Vertex largely green, dusted with yellowish-brown, on each side of ocelli a bluish space. Post-ocular cilia black above, white below; a few post-oral bristles present. Thoracic dorsum when viewed from the front dusted with yellowish-brown, wholly green except a purplish line on outer side of acrostichals, gradually wider behind, where it covers the dorsum except a pre-scutellar, triangular green spot. Above the base of the wing a  $\sim$ -shaped black velvety spot extends forward, terminating above in a silvery spot visible only from above. Scutellum green, with brownish dust, glabrous. Abdomen green, broadly silvered at sides, toward base of each segment cupreous; incisures blackened; first segment laterally with a strongly-marked marginal row of erect black bristles. Hypopygium subpedunculate, rather slender, dorsal half obliquely marked with green, glaucous, apical half (=remainder) shining, translucent yellow, internal appendages fuscous, enlarged, appearing like a second set of lamellæ; at base of these is a close fringe of yellow bristles; penis not projecting; lamellæ yellow, rather small, bent backward, circular at tip, fringed with light straggling hairs. Pleura concolorous with sides of abdomen. Fore coxæ pale yellow, silvery in front, and with a moderate coating of black hairs; middle and hind coxæ glaucous basally on outer face; middle coxæ with several black bristles anteriorly and hind coxæ with its usual bristle on outer side. Legs wholly yellow except toward tip of tarsi, where infuscation commences; metatarsus of fore legs shorter than three joints following, of middle legs shorter than two following, and of hind legs shorter than next joint; hind femora with a strong bristle on



lower outer surface below the usual preapical one. Wings with typical neurulation; the anterior region along the veins with a distinct darkening; posterior cross-vein inclines rather toward outer part of the fourth vein; anal angle full, almost rectangular. Cilia of the yellow tegulæ black. Halteres yellow.

One male taken along the Colorado River, south of Austin, Texas, October 7th, 1899, by Dr. Wm. M. Wheeler.

From allied forms the present species may be readily recognized as follows:

From *cognatus* by the green vertex, violet thorax, and shorter plumosity of the arista.

From *lineatus* it differs in the coloration of the thorax, the subpedunculate hypopygium and the lighter coloured lamellæ.

7. *Paraclius hybridus*, n. sp. (Figs. 4, 5.)

*Male*.—Length 3.75–4.25 mm., wing 3.5–4 mm. Face and palpi covered with a golden-gray dust, partially shining, face rather broad. Proboscis prominent, piceous, gray-dusted. Antennæ red; third joint slightly longer than broad, bluntly pointed, infuscated, especially towards tip; arista tapering, moderately plumose. Front cupreous, dusted with golden. Post-ocular cilia yellowish below. Dorsum of thorax and scutellum bronzed, opaque-dusted. Immediately above base of wing a black spot extends forward. Abdomen bronzed, somewhat shining, gray-dusted, especially towards sides. Hypopygium subsessile; lamellæ small, triangular, piceous except at base on dorsal side, where pubescence is also lighter. The usual lamellar filament is wholly wanting. Pleura glaucous. Coxæ with black hairs; fore coxæ yellow, except extreme base; middle coxæ glaucous largely, and hind ones less so, on outer side. Legs reddish yellow; tarsi darkened from tip of first joint; hind femora ciliate with short black hairs below. Wings grayish-hyaline; bend of fourth vein less sharply angulate than in *propinquus*. Tegulæ and halteres yellow; halteres with black cilia.

*Female*.—Length 3.75–4.75 mm., wing 3.25–4.25 mm. Coloration as in male.

Seven males and five females taken at Woods Holl, Mass., July 14th to 27th, 1899, by Dr. Wm. M. Wheeler.

This species was taken in the same netful with another *Paraclius* and a *Pelastoneurus*. The proportions taken were:

	Male.	Female.
<i>Pelastoneurus lamellatus</i> , Loew.....	15	18
<i>Paraclius hybridus</i> .....	9	5
<i>Paraclius propinquus</i> , Wheeler.....	21	13

The intermediate character of the new species seems to indicate a case of hybridism, but the data are not sufficient to bear out this supposition. *Hybridus* shows affinity for *Pelastoneurus* in the trend of the fourth longitudinal vein and in the lack of the filamentous appendages of the hypopygial lamellæ. The other characters are, however, Paraclian. It may be readily recognized by the following combination of characters: Antennæ largely red; base of fore coxæ narrowly dark; front bronzed; lamellæ of hypopygium triangular.

8. *Nematoproctus venustus*, n. sp. (Fig. 12.)

*Male*.—Length 4.75 mm., wing 4.5 mm. Face narrow, of nearly equal width, reaching three-fourths of the distance from the antennæ to the lower corner of the eye, covered with silvery dust. Palpi small, yellow, inserted at sides of proboscis. Proboscis piceous, sparsely pubescent. Antennæ short, reddish; first joint longest, glabrous; third ovate, short, with dorsal, long, bare arista (pubescence scarcely perceptible under higher power). Front shining green, the white of the face encroaching along the sides above the antennæ. Post-ocular cilia yellow; lower occiput with long yellow hairs. Eyes hairy. Thoracic dorsum and scutellum brilliant green, slightly dusted anteriorly, and with faint indications of median cupreous stripings; above the base of the wing a velvety black spot present, stronger anteriorly. Abdomen hairy, incisures blackened; first segment brassy green, second and third translucent yellow, fourth cupreous becoming green, sixth green; hypopygium small, rounded, piceous, pubescent, terminal, with long, filiform, infuscated, hairy appendages; internal appendages inconspicuous; penis short, perpendicular. Pleura greenish, gray-dusted. Middle and posterior coxæ concolorous with pleura; anterior coxæ yellow. Legs yellow, except posterior tarsi and outer fourth of posterior tibiæ, which are infuscated; pulvilli not conspicuous. Wings clear, broadest about the middle; last segment of fifth vein once and one-half the length of the cross-vein; cross-vein oblique; last section of fourth vein converging towards third, then subparallel towards tip, distant from third vein, and terminating at tip of wing. Halteres and tegulæ yellow; tegular cilia long, pale yellow.

One male specimen taken by Mr. C. W. Johnson, at Westville, N. J., June 6.

Though the genus *Nematoproctus* has been abandoned by European dipterologists, it may be reinstated, at least provisionally, for this species whose habitus is different from any North American *Diaphorus* with which genus *Nematoproctus* has been united. The genus has never before been recognized outside of Europe.

9. *Tachytrechus volitans*, n. sp. (Fig. 8.)

*Male*.—Differs from *Floridensis* as follows: Front thickly covered with brownish dust, face with ochraceous dust. First joint of antennæ, when viewed from behind, brownish; when viewed from the front, opaque-black, except inner projection. Ground-colour of thorax of a brilliant metallic copper-colour, which shines through the thick coating of brown dust. Pleura and coxæ heavier white-dusted. Hind femora dark up to very tip. Pulvilli relatively longer, snow-white. Abdomen more cupreous. Pedicel of hypopygium more slender; hypopygium with penis projecting, distinct; lamellæ of similar form, but without the long black basal bristles, and evenly and closely fringed on outer side with longer hairs. The spot at tip of wing arises at tip of third vein and passes back so that the fourth vein bisects it. The third vein arches posteriorly at outer fourth. The fourth vein bends backwards at tip. The posterior cross-vein is less oblique and more sinuate.

The female differs from the male in the same characters as in *Floridensis*.

One male and one female, from twelve miles north-west of Lusk, Wyoming; July, 1895; from the collection of the University of Kansas

10. *Tachytrechus protervus*, n. sp. (Figs. 6, 7.)

*Male*.—Length 4.25 mm., of wing 4 mm. Face narrowed in middle, silvery dusted, yellower toward antennæ. Antennæ large, yellow; first joint short, second and third fully developed; third joint rounded, infuscated above and toward tip, bearing the dorsal arista once and two-thirds the length of the antenna. Vertex brownish-velvety. Post-ocular cilia black above, pale yellow, slender below. Thorax piceous green; above the base of the wing the horizontal black velvety macule and anterior silvery spot are present, above the former the dorsum is cupreous. Abdomen dark green, silvery-dusted along sides, incisures well marked. Hypopygium piceous, lamellæ subrectangular, dark, hairy, evenly fringed with short black hairs, which are lighter dorsally toward base. Pleura

black, silvery-dusted; metapleura prominent; coxæ concolorous except extreme tip, fore coxæ bronze-dusted in front. Legs black, except the following: Tips of femora below, basal two-thirds of middle and hind tibiæ, and front metatarsi, which are dark yellowish. The fore legs are ornamented as follows: Tibiæ thickened, dusted with yellow on anterior surface, and with longitudinal rows of short black bristles; tarsi compressed, first joint a little shorter than the rest together, pulvilli large. Wings hyaline; anal angle much fuller than in *angustipennis*; fourth vein turned forward toward third, ending considerably before the tip of the wing; posterior cross-vein distant its length from the apex of the fifth vein, bowed inward and surrounded by a very faint cloud. Tegular cilia black.

*Female*.—Length 5.5 mm., of wing 5 mm. Differs as follows from the male: Face ochraceous. Infra-ocular cilia a little stronger. Vertex, thorax, and abdomen a more brassy, brighter green. Red at tip of femora more spread, and at base of middle and posterior tibiæ more restricted; fore tibiæ yellow, with ordinary bristles; fore tarsi not compressed, first joint equal to next three. Wings with faint yellowish tinge, cross-vein more oblique.

One male from Clementon, N. J., May 10, 1896, and one female from Delaware Water Gap, N. J., July 8. Both specimens were received from Mr. C. W. Johnson.

The following combination of characters briefly distinguishes this species from all the known species of *Tachytrechus*:

Male artista without an enlargement; fourth vein curved forward, ending near third and distant from tip; cilia of inferior orbit pale; wings unspotted; antennæ largely red; fore femora plain, more or less yellow-tipped.

In 1878 Mik\* established the genus *Macellocerus*, basing it upon *Tachytrechus machus*, Loew. From *Tachytrechus* this genus differed thus: "Zweites Fuehlerglied rudimentaer, das dritte klein, mit ausserordentlich verlaengerter, dorsaler Borste, welche am Ende schaufelfoermig erweitert ist. Der letzte Abschnitt der vierten Laengsader convergirt stark gegen die dritte, so dass die Muendungen dieser beiden Adern nahe einander stehen." The addition of *protervus* leaves *Macellocerus* based upon a single male character. Concerning the inadvisability of erecting a genus upon *machus*, Dr. Loew had already written.†

\*Zur Kenntnis der Dolichopodiden, Dipterologische Untersuchungen, p. 5.

†Morographs of N. Am. Dolichopodidæ, p. 112.

CLASSIFICATION OF THE FOSSORIAL, PREDACEOUS AND  
PARASITIC WASPS, OR THE SUPERFAMILY  
VESPOIDEA

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(Paper No. 1.)

In the CANADIAN ENTOMOLOGIST, during the year 1898, I gave a series of papers on the classification of the horntails and sawflies, representing the superfamilies SIRICOIDEA (Xylophaga) and TENTHREDINOIDEA (Phyllophaga); while the past year, 1899, I gave a classification of the entomophilous wasps, or the superfamily SPHECOIDEA (incorrectly spelt Sphegoidea).

The present year, 1900, with the permission of the Editor, it is my intention to give a similar series of papers on the classification of the superfamily VESPOIDEA, a large natural group, representing the genuine fossorial wasps, the papermaking wasps, potter wasps, and the predaceous, inquilinous and parasitic wasps.

The wasps belonging to this superfamily are apparently closely allied to the wasps in the superfamily Sphecoidea, and have been quite recently classified with them; but they differ too widely, in various ways, to be included in the same family.

The superfamily Vespoidea I consider a compact, natural group, and it is readily separated from the Sphecoidea by the species falling in it *always having the posterior lateral angles of the pronotum extending back to and touching the tegulae, leaving no space, or sclerite, between.*

The *trochanters* in all the families in this superfamily, except in the single family *Trigonalidae*, are, as in the entomophilous wasps, composed of a single joint; but in this family, however, there are *two* more or less well defined *joints*, a character overlooked when I published my table of superfamilies in the Journal of the N. Y. Entomological Society, Vol. VII., p. 46.

The table, therefore, should be corrected to read as follows:

cc. Trochanters 2-jointed.

Mandibles large, 4-dentate; hind wings *with* a distinct venation,  
with two basal cells and a

radius.....Superfamily III., Vespoidea (pars).

Mandibles never very large nor 4-dentate, either simple, bi-dentate, or at most 3-dentate; hind wings *without* a distinct venation, at most, and *rarely*, with only one basal cell, the radius always absent. . . . . Superfamily V., Proctotrypoidea.

#### SUPERFAMILY III.—Vespoidea.

The families belonging to this superfamily may be distinguished by the characters made use of in the following table:

##### Table of Families.

Abdomen either sessile or petiolate, with the first ventral segment distinctly separated from the second by a more or less deep *constriction* or *transverse* furrow; legs most frequently fossorial. . . . . 5.  
Abdomen either sessile or petiolate, but the second ventral segment *not* separated from the first by a strong constriction or transverse furrow; if somewhat constricted, then the legs are *not* fossorial and the wings are usually folded in repose; in the former case the legs may be either fossorial or simple.

Posterior legs usually short, the femora rarely reaching to or at least extending much beyond the middle of the abdomen; legs most frequently not fossorial. . . . . 2.

Posterior legs long, the femora most frequently reaching to or beyond the tip of the abdomen; tibiæ in ♀ most frequently serrate or spinous, more rarely entirely smooth; middle tibiæ with two apical spurs. . . . . Family XXVII., Pompilidæ.

2. Wings not folded in repose; ♀ sometimes apterous. . . . . 3.  
Wings folded in repose; never apterous.

Claws simple; middle tibiæ with two apical spurs; sexes three, ♀ ♀ ♂ . . . . . Family XXVIII., Vespidæ.

Claws with one or more teeth beneath; middle tibiæ with one or two apical spurs; sexes two, ♀ and ♂ . . . . . Family XXIX., Eumenidæ.

3. Metathoracic angles usually acutely produced, the metanotum posteriorly concave; scutellum large, flat, convex, conical or spined; if the metathoracic angles are rounded, which occurs rarely, the abdomen has only from 3 to 5 visible segments.

Abdomen normal, with at least 6 distinct segments, the venter flat; antennæ usually strongly clavate, in ♀ knobbed at apex; scutellum very large, flat; species *not* metallic; antennæ never more than 12-jointed. . . . . Family XXX., Masaridæ.



Abdomen abnormal, with from 3 to 5 visible segments, the terminal segments most frequently retractile, telescopic-like, the venter concave or flat; species metallic; antennæ most frequently filiform, inserted close to the anterior border of the head, 13-jointed, scutellum convex, conical or spined, rarely flat.....Family XXXI., Chrysididæ.

Metathoracic angles rarely toothed or acutely produced, the metanotum posteriorly squarely truncate or rounded, not concave; scutellum normal or in some wingless females entirely absent; antennæ filiform or subclavate, rarely flabellate in some males; abdomen always with more than 5 dorsal segments.

Hind wings *with* a distinct venation, and always *without* anal lobes; females never apterous. ....4.

Hind wings *without* a distinct venation, and always *with* an anal lobe; females often apterous; middle tibiæ with two apical spurs; antennæ 10- to 26-jointed...Family XXXII., Bethyliidæ.

4. Trochanters 2-jointed; middle tibiæ with *two* apical spurs; eyes normal, *not* emarginate within; antennæ long, filiform, 15-jointed or more, similar in both sexes....Family XXXIII., Trigonaliidæ.

Trochanters 1-jointed; middle tibiæ with *one* apical spur; eyes reniform or emarginate within; antennæ in ♀ 12-jointed, in ♂ 13-jointed.....Family XXXIV., Sapygidæ.

5. Middle coxæ contiguous or nearly.....7.

Middle coxæ distant, usually widely separated.....6.

6. Stigma in the front wings *not* well developed, at the most only slightly developed, either very small or linear; eyes most frequently emarginate within; middle tibiæ with two apical spurs.

Pygidium in ♂ deeply emarginate at apex, the hypopygium terminating in a sharp thorn or aculeus, which curves upwards and rests in the emargination of the pygidium; claws cleft.....Family XXXV., Myzinidæ.

Pygidium in ♂ entire, or at most with only a slight sinus, the hypopygium terminating in three spines; claws simple.....Family XXXVI., Scoliidæ.

Stigma in front wings well developed, ovate or subovate; eyes entire, never emarginate within; pygidium in ♂ entire, the hypopygium terminating in a sharp aculeus which curves upwards.....Family XXXVII., Tiphidæ.

7. Females always apterous, and frequently, but not always, without ocelli; eyes variable.....9.  
 Females always winged, with ocelli; eyes large, always extending to base of mandibles.....8.

8. Abdomen sessile or subsessile, and often with a more or less distinct constriction between dorsal segments 1 and 2; front wings with the stigma well developed, the marginal cell usually attaining the costa at apex (rarely rounded or truncate at apex, with a slight space between *Cosila* and allies); hind wings usually without an anal lobe, the cubitus either interstitial or originating beyond the transverse median nervure; very rarely originating before it; tibial spurs 1, 2, 2; tarsal joints normal; eyes entire; ocelli normal; hypopygium entire, not ending in a spine or an aculeus. Family XXXVIII., *Cosilidæ*.  
 Abdomen longly petiolate; front wings with the stigma small, not well developed, the second recurrent nervure subobsolete; hind wings bilobed, the cubitus originating far beyond the transverse median nervure; tibial spurs very long, straight; tarsal joints 2-3 in ♀ dilated, deeply excised or lobed and filled with a membrane between the lobes; eyes emarginate within; ocelli very large; antennæ very long, filiform, the joints with a bristle-like spine at apex..... Family XXXIX., *Rhopalosomidæ*.

9. Middle tibiæ with two apical spurs, rarely with one only, or none in some males.

Middle coxæ usually slightly separated by a triangular or bilobed projection of the mesosternum; females with the thorax divided into three parts, the pygidium usually subcompressed or otherwise formed, usually abnormal; hypopygium in ♂ most frequently armed..... Family XL., *Thynnidæ*.

Middle coxæ contiguous, not separated by a triangular or bilobed projection of the mesosternum, the latter being squarely truncate at apex.

Thorax in the ♀ divided into two parts; pygidium normal; hypopygium in ♂ produced into a sharp aculeus which curves upwards (very rarely simple, unarmed); hind wings with a distinct anal lobe, the cubitus originating from the apex of the submedian cell, interstitial with the transverse median nervure, or rarely originating beyond it..... Family XLI., *Myrmosidæ*.

Thorax in ♀ undivided, all the parts being closely united or soldered together, and *without* visible sutures between; pygidium normal; hypopygium in ♂ simple, unarmed, but the genital plate is armed with two slender straight spines which project more or less distinctly from the tip of the abdomen; hind wings *without* an anal lobe, the cubitus originating far *before* the transverse median nervure. . . . . Family XLII., Mutillidæ.

FAMILY XXVII.—Pompilidæ.

This family, which is the first to be treated of in the superfamily, has long been known under the family name *Pompilidæ*.

The first genus to be described in the family, however, was *Ceropales*, Latreille, in 1796, which antedates *Pompilus*, Fabr., fully two years, the latter not being described until 1798, so that, following the now well-established rule in zoological nomenclature, viz., that a family name must be based upon the first genus described, the name *Pompilidæ* should probably give way to CEROPALIDÆ.

I am opposed to changing a well-established family name, and after much hesitation and long deliberation, I venture to retain this long-established family name.

The family Pompilidæ is quite distinct from all the others in the superfamily, by the uniform *habitus* of the species, the only group with which any of the species could be confused being probably some forms in the *Vespidæ* (subfamily Polistinæ), some species of which bear a superficial resemblance in size, colour and shape to *Pompilus* and allies; but the non-folded wings, the venation of the wings, and the length and characteristic features of the legs, as well as cephalic, mandibular and palpal characters, readily separate them from the *Vespidæ*.

The history of the family and our present knowledge of the genera, may be best shown by giving the bibliography of the genera in chronological order, as follows:

- 1796.—*Ceropales*, Latreille, Prec. car. gener. Insect, p. 123. 1798.—*Pompilus*, Fabricius, Syst. Entom. Suppl., p. 246. 1804.—*Salix*, Fabricius, Syst. Piez., p. 124. 1806.—*Cryptocheilus*, Panzer, Krit. Revis. II., 120. 1808.—*Aporus*, Spinola, Insect. Ligur., II., p. 5. 1822.—*Planiceps*, Latreille, Nouv. dict. hist. natur., p. 2. 1830.—*Macromeris*, Lepeletier, Magas. de Zool., I., pp. 29-30. 1836.—*Chirodamus*, Haliday,

Trans. Linn. Soc. Lond., XVII., p. 326. 1837.—*Agenia* (p. 321), *Priocnemis* (*Prionocnemis*), p. 325, and *Episyron*, p. 34., Schiödte, Naturh. Tidsskr., I. 1840.—*Mygnumia*, Shuckard, Nat. Arrang. Insects, p. 179. 1844.—*Platyderes*, Guérin, Icon. regn. anim., VII., Insects, p. 435. 1845.—*Entypus* (p. 35), *Hemipepsis* (p. 123), *Homonotus* (p. 414), *Pogonius* (p. 453), *Ctenocerus* (p. 456), and *Cyphononyx*, Dahlb. (p. 461), Hym. Eur., I. 1845.—*Evagetus* (p. 390), *Micropteryx* (p. 396), *Calicurgus* (p. 397), *Anoplius* (p. 442), *Ferreola* (p. 467), and *Pallosoma* (p. 492), Lepeletier, Hist. nat. des Ins. Hym., III. 1851-2.—*Clavelia*, Lucas (= *Ctenocerus*, Dahlb., preoc.), Ann. Soc. ent. Fr. (2), IX.; Bull., p. 1, XXV.; et (2) X., p. 417. 1855.—*Maurillus* (p. 170), *Notocyphus* (p. 172), and *Parapompilus* (p. 176), Smith (= *Micropteryx*, Lapel., preoc.), Cat. Hym. Brit. Mus., III. 1867.—*Entypus*, Saussure, nec Dahlbom, Reise de Novara, Hym., II., p. 50. 1884.—*Paracyphononyx*, Magretti, Ann. Mus. civ. Genova, XXI., p. 44. 1884.—*Sphictostethus*, Kohl (p. 47); *Hoploneura*, Kohl (p. 47), = *Hoploneurion*, Kohl, and *Epipompilus*, Kohl (p. 57), Verh. Zoolog.-bot. Gesell. in Wien. 1887.—*Diplonyx*, *Cyphononyx* (*Cyphononyx*), *Heteronyx*, and *Schistosalius*, Saussure, Soc. Ent., II., p. 3. 1887.—*Lophopompilus*, p. 42, and *Pompiloides*, Radoszkowski, p. 94, Horæ Soc. Ent. Ross, XXI. 1887.—*Telostegus* (p. 88), *Wesmalinus* (p. 46), and *Pseudopompilus* (p. 80), Costa (A.), Prosp. Imen. Ital., II. 1888.—*Pseudoferreola*, Radoszkowski (p. 477), *Ceropaleoides* (p. 486), and *Prionocnemoides*, Radoszkowski, Bull. Soc. Natural d. Moscow. 1889.—*Meracus*, Tournier, Entom. Genev., I., p. 137. 1892.—*Hemisalius* (p. 313), *Hemipogonius* (p. 334), *Stenagenia* (p. 338), *Ctenagenia* (p. 342), and *Schistonyx*, Saussure, in Grandidier's Hist. de Madagascar, XX.

#### Classification of the Family.

Comparatively little effort has been made by those who have treated of these wasps to indicate the natural major groups of the family, or to indicate the natural relationship of the different genera.

Lepeletier, in Histoire Naturelle des Insectes, Hymenopteres, tome III., 1845, treats the family as representing two tribes in his Famille 14, Les Sphecides, viz., 4° Tribu. Pompilites, with 9 genera: *Aporus*, *Evagetus*, *Planiceps*, *Salius*, *Micropteryx*, *Calicurgus*, *Pompilus*, *Anoplius* and *Macromeris*; and 5° Tribu. Pepsites, with 4 genera: *Ceropales*, *Ferreola*, *Pepsis* and *Pallosoma*.

Frederick Smith, in his Catalogue of the Hymenoptera in the British Museum, Vol. III., 1855, ignores these tribes, but correctly treats the family as distinct from the Sphecidae. He has recognized 13 distinct genera, arranged in the following sequence: *Pompilus*, *Maurillus* n. g., *Salius*, *Notocyphus* n. g., *Ctenocerus* (= *Clavelia*, Lucas), *Planiceps*, *Aporus*, *Parapompilus* n. n.; for *Micropteryx*, Lepel.; *Ceropales*, *Macromeris*, *Mygimia* and *Pepsis*.

Under the genus *Pompilus*, Smith incorrectly includes as synonyms *Priocnemis*, *Agenia*, *Episyron*, *Calicurgus* and *Anopilus*. *Maurillus*, Smith, placed by Dalla Torre in his recent catalogue as a synonym of *Pompilus*, does not belong to the family, but is evidently a good genus in the family *Cosiliidae*, to which family also belong *Dicrogenium*, Stadelmann, described as a Bethyloid, and *Fedtschenkia*, Saussure, at present placed with the *Mutillidae*.

The next paper of any great importance on the group, is by Dr. Franz Frederick Kohl, entitled "Die Gattungen der Pompiliden," published in the Verhandlungen Zoolog-botanischen Gesellschaft in Wien, 1884, pp. 33-58.

In this important contribution Dr. Kohl gives a table of genera and has recognized as valid 15 genera and several subgenera and groups, arranged as follows.

I.—*Macromeris*, Lepeletier. Type *M. splendida*, Lepel. II.—*Agenia*, Schiöde. Types *A. variegata*, L., and *A. bifasciata*, Fabr. III.—*Pseudagenia*, Kohl, n. g. Type *Agenia carbonaria*, Scop. IV.—*Salius*, Fabricius. Types *S. bicolor* and *S. punctatus*, Fabr., = *Priocnemis*, Schiöde; *Hemipepsis*, Dahlb.; *Homonotus*, Dahlb.; *Entypus*, Dahlb.; *Pallosoma*, Lepel.; *Mygimia*, Smith.

Four groups of subgenera are indicated: Gr. (1) *Cyphonyx*, (2) *Priocnemis*, (3) *Hemipepsis*, and (4) not named, with *Hemipepsis heros*, Guerin, as type. V.—*Calicurgus*, Lepeletier. Type *C. fasciatellus*, Lepel. VI.—*Pepsis*, Fabricius. Types *P. ruficornis*, *dimidiata*, *amethystina*, *cærulea*, *stellata*, *elevata*, and *grossa*, Fabr. VII.—*Sphictostethus*, Kohl, n. g. Type *Pompilus Gravesii*, Hal., = *Agenia speciosa*, Spin. VIII.—*Hoploneura*, Kohl, n. g. Type *H. apogona*, Kohl. This genus was subsequently changed to *Hoploneurion*. IX.—*Parapompilus*, Smith, = *Micropteryx*, Lepel. Type *P. (Micropteryx) brevipennis*, Lepel. X.—*Clavelia*, Lucas, = *Ctenocerus*, Dahlb. Type *C. pompiliformis*, Lucas. XI.—*Notocyphus*, Smith. Type *N. lævis*.

simus, Smith. XII.—*Ceropales*, Latreille. Type *C. maculata*, Fabr. XIII.—*Pompilus*, Fabricius. Types *P. viaticus*, *ursus*, Fabr., = *Aporus*, Spin.; *Episyron*, Schiödte; *Anoplius*, Lepel.; *Evagetes*, Lepel.; *Salius*, Dahlb.; *Homonotus*, Dahlb., and *Ferreola*, Smith.

Dr. Kohl, however, recognized 18 minor groups, briefly defined, but without specifying, in most cases, the species belonging in them. His groups he has arranged thus: Gr. (1), *Pompilus*, Thoms.; Gr. (2), *Aporus*; Gr. (3), no name; Gr. (4), no name; Gr. (5), *Aporus*; Gr. (6), no name; Gr. (7), no name; Gr. (8), *Aporus*; Gr. (9), no name; Gr. (10), *Aporus*; Gr. (11), *Aporus*; Gr. (12), *Episyron*, Schiödte; Gr. (13), *Pompilus 6-maculatus*, Spin., = *venustus*, Wesm., = *fraterculus*, Costa; Gr. (14), *Aporus*; Gr. (15), *Homonotus*, Dahlb., p. 35; *Salius sanguinolentus*, Dahlb., p. 34; Gr. (16), *Ferreola*, Smith; Gr. (17), *Ferreola*, Smith; Gr. (18), *Pedinaspis*, Kohl. Type *P. operculatus*, Klug.

XIV.—*Planiceps*, Latreille. Type *Pompilus planiceps*, Latr. XV.—*Epipompilus*, Kohl, n. g. Type *E. maximiliani*, Kohl.

This arrangement of Dr. Kohl's is in no sense a natural one. He has "lumped" many good genera (or natural groups) and interpolated, or at least brought into juxtaposition, genera or groups that are *widely separated*, and, again, widely separated others that are closely allied. I hope to bring this out clearly in my tables later on, when I shall call more special attention to some of these unnatural groupings.

Dr. Paolo Magretti, in this same year, 1884, in the Ann. Mus. Civ. Genova, Vol. XXI., p. 44, established the genus *Paracyphonyx*, an interesting new genus allied to *Cyphonyx*.

In 1887, Achilles Costa, in his Prosp. Imen. Ital., II., established three new genera, recorded above.

Genl. O. Radoszkowski, in the Bull. de la Soc. Imp. des Nat. de Moscow, (2) II., 1888, in his paper entitled "Revision des armures copulatrices des males de famille Pompilidæ," points out and figures excellent characters in the male genital organs of several genera. The difference in the male copulatory organ in *Ceropales* was so great that he remarks: "L'armure copulatrice du genre *Ceropales* n'a rien de commun avec la famille Pompilidæ, except la presence de palpes genital."

Genl. Radoszkowski subsequently makes *Ceropales* the type of a distinct family, the *Ceropalidæ*. The group is a natural one, and is here treated as a subfamily.



Tournier's genus *Meracus*, established in 1889, Entom. Genev., I., p. 137, I do not know, nor have I seen the description.

Saussure, in Grandidier's Histoire de Madagascar, Vol. XX., 1892, following the ideas of Lepeletier, recognized two tribes, *Pompiliens* and *Pepsiens*, but gives no substantial characters to support this separation, his tribe *Pepsiens* being composed of the genus *Pepsis*, and the *Pompiliens* of all the other genera.

The last author who has treated of the family is our well-known American hymenopterologist, Wm. J. Fox, of the Philadelphia Academy of Sciences, who, in the Proc. Phila. Acad. Sci. for 1894, divided the family into three tribes, (1) *Ceropalini*, (2) *Notocyphini*, and (3) *Pompilini*.

Two of these groups, the *Ceropalini* and the *Notocyphini*, are natural groups, the first correctly separated by Radoszkowski, but the third, or the *Pompilini*, is, as interpreted by Fox, a most unnatural group—a *potpourri* for the residue of the Pompilid genera.

The greatest difficulty in a study of the family has been the correlation of the very dissimilar sexes of some of the genera and the separation of the family into natural major groups. This difficulty has been the stumbling-block upon which most of the older authors fell, and upon which even to-day some of our most active workers are stumbling. Two or three cases may be cited for example: Fox, in Tr. Am. Ent. Soc., XVIII., described two Pompilids from Jamaica, *Salix opacifrons* ♀ and *Agenia compressa* ♂; both, however, represent a single species, and neither sex belongs to the genus assigned to it by Fox. Another case in point is the *Agenia belfragei*, Cresson, a male insect, which was probably placed here by Cresson and Fox on account of the smooth, non-spinous legs, but which has no relation with a true *Agenia*.

Many other cases could be cited, but these, I think, will do to show the difficulty of the study of the Pompilidæ, and how deficient our generic definitions must be when our most able hymenopterologists are so easily led astray by superficial resemblances.

My studies in the family convince me that there are at least six major groups in the family, designated here as subfamilies, distinguished as follows:

#### Table of Subfamilies.

Labrum large, free, distinct; anterior tarsi in ♀ always *without* a comb, the hind tibiæ smooth, never *spinous*, or at most with only a few *feeble*, scarcely perceptible spines.....5.

Labrum neither large, *free*, nor distinct, usually entirely hidden under the clypeus, or at most with only a part—the tip—exposed; anterior tarsi in ♀ most frequently *with* a comb; hind tibiæ in ♀ frequently serrate and spinous, or only spinous, more rarely smooth, *without* spines, except in males.

Second ventral segment always *without* a transverse grooved line, impression or emargination; hind tibiæ in ♀ *never* serrate, although usually spined in both sexes; stigma rarely well developed. . . . 2.

Second ventral segment in ♀ *with* a distinct transverse grooved line, impression or emargination; stigma well developed.

Hind tibiæ in ♀ most frequently strongly serrate and also spinous, rarely *without* teeth or indistinctly serrate, in the latter case with a strong longitudinal ridge; in ♂ simple, neither serrate nor spinous, the hind tarsi very long, often more or less flattened or compressed, the basal joint long and often bent or more or less curved; second ventral segment *with* a transverse grooved line or emargination in both sexes. . . . Subfamily I., Pepsinæ.

Hind tibiæ in *both* sexes smooth, *without* teeth or spines, at the most with *very* minute, scarcely perceptible or feeble spines, never with a distinct longitudinal ridge; second ventral segment *with* the transverse grooved line present in ♀ only, absent in ♂ . . . . Subfamily II., Ageniinæ.

2. Hind tibiæ in *both* sexes smooth, *without* spines, or at most with *very minute*, scarcely perceptible or feeble spines. . . . 3.

Hind tibiæ in *both* sexes always strongly or distinctly spined, the spines always well developed.

Antennæ inserted on the anterior margin of the head *on* or *below* an imaginary line drawn from the base of the eyes; head antero-posteriorly very thin, the face, clypeus and temples in ♀ very flat. . . . 4.

Antennæ inserted *far above* such a line, or on or *near* the middle of the face, or at least considerably *above* the basal suture of the clypeus; head normal, or nearly; front wings with two or three cubital cells.

Clypeus anteriorly not produced, truncate or emarginate, not wholly covering the mandibles; pronotum rarely long. . . . Subfamily III., Pompilinae.

Clypeus anteriorly semicircularly produced, covering the mandibles; pronotum always long, at least as long as the mesonotum.....Subfamily IV., Planicipinæ (pars).

3. Front wings with three cubital cells.

Head antero-posteriorly not especially thin, the face and clypeus at least subconvex, never flat; the antennæ inserted *on* or *near* the middle of the face, always considerably above an imaginary line drawn from bases of eyes. (Males only). Subfamily II., Ageniinae.

Head antero-posteriorly very thin, the face and clypeus very flat, the antennæ inserted towards the anterior margin of the head *on* or or just above an imaginary line drawn from bases of eyes (♀ and ♂).....Subfamily IV., Planicipinæ (pars).

4. Pronotum as long or longer than the mesonotum; front coxæ long, usually longer than the hind coxæ, the front femora in ♀ often much swollen or greatly incrassated.....Subfamily IV., Planicipinæ.

5. Pronotum very long; metanotum as long or longer than the mesonotum; eyes entire, *not* at all emarginate within; antennæ in ♀, after death, involute at tips; cubitus in hind wings interstitial or originating *before* the transverse median nervure; hind tibiæ not or rarely longer than their femora, usually shorter.....Subfamily V., Notocyphinae.

Pronotum not long, shorter than the mesonotum; metanotum short, much shorter than the mesonotum and obliquely truncate posteriorly; eyes *subemarginate within*; antennæ in ♀, after death, straight, *not* involute; cubitus in hind wings originating *beyond* the transverse median nervure; hind tibiæ much longer than their femora.....Subfamily VI., Ceropalinæ.

### THE LARVA OF EUSTIXIA PUPULA, HUBN.

BY HARRISON G. DYAR, WASHINGTON, D. C.

The larva of this not uncommon little Pyralid feeds on the seeds of the peppergrass. It has not been described heretofore; the name as given by Packard (American Naturalist, IV., 229) is an error of identification, the species which he represents, copied from Abbot's manuscript drawing, being *Enamia crassinervella*, Zell., a Tineid. The true larva of *E. pupula* lives singly in the heads of the peppergrass in a loose open web, eating the unripe seeds out of the flat pods, forming two holes in each pod on the upper side. The larvæ, though fully exposed,

are difficult to see, as their colours harmonize well with the general appearance of the flower heads. The delicate open web is not conspicuous.

The number of larval stages has not been definitely determined, but I think there are seven. At first the little larva is entirely green, the head only pale testaceous. Later (by stage IV.) there are faint subdorsal and subventral pale shades with slight dusky bands between.

*Stage V.*—Green, subdorsal and subventral lines yellowish, faint, not distinctly broken in the incisures, the red shades between them faint; width of head 8 mm.

*Stage VI.*—Head slightly below joint 2, testaceous green, the clypeus high; width 1 mm. Body slender, green, the segments faintly transversely banded with yellow, also yellowish subventrally; dull crimson dorsal and lateral patches in the yellow bands, fainter at the extremities. Setæ long, slender, dusky, iv. + v. on the prominent subventral fold.

*Stage VII.*—Head green, mottled with brown over the lobes, ocelli black; width 1.2 mm. Body green, subventral fold narrowly whitish, dorsal segmental bands of dull crimson reaching the subventral fold, the edges irregular, projecting a little before at the spiracle. Setæ fine, dusky, rather long. The bands are on every segment from the prothoracic to the tenth abdominal.

*Cocoon* of silk, small and tough.

*Food plant* peppergrass (*Lepidium virginicum*).

#### LARVÆ FROM HAWAII—A CORRECTION.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Meyrick's work on the Macrolepidoptera of the Hawaiian Islands\* is a revelation of our previous ignorance of that fauna, since he describes no less than 200 new species out of a total of 292.

I have formerly described the larva of a Noctuid from Hawaii as *Laphygma flavimaculata*, Harv., but find, on consulting Mr. Meyrick's paper, that the name was wrongly applied. The five larvæ bred by me in Hawaii are as follows:—

*Lycæna boetica*, Linn.

Larvæ within the flowers of *Crotalaria longirostrata* at Honolulu.

\*Fauna Hawaiiensis, Vol. I., part 2, Macrolepidoptera, by E. Meyrick, 1899.

Eggs, four larval stages and chrysalis observed ; widths of head .15, .3, .6, 1.0 mm. It is not necessary to describe at length this common European species.

*Sphinx convolvuli*, Linn.

Described as *Protoparce ciugulata*, Ent. News, VI., 95, 1895.

*Spodoptera mauritia*, Boisd.

Described as *Laphygma flavimaculata*, CAN. ENT., XXVI., 65, 1894. The true *flavimaculata*, Harv. (= *Spodoptera exigua*, Hübn.), was taken, but not bred. The species were confused.

*Plusia chalcites*, Esp.

Larva a general feeder ; found at Honolulu. Abdominal feet on joints 9, 10 and 13. Head rounded, clypeus large, green, with a few black dots in some and a line on the side, some distance behind the ocelli. Body green, somewhat transparent, tubercles black. Double dorsal and subdorsal lines, crenulate, pale yellow, the subdorsal ones forming curves around the tubercles, not crossing them ; a single, straight faint substigmatal line ; spiracles black.

Pupa very pale green with a broad brown band on the back, which is irregularly streaked transversely with darker brown. In a thin cocoon of white silk.

Found on *Ipomœa*, *Crotalaria*, *Canna*, etc.

*Omiodes Blackburni*, Butl.

Meyrick says the larva feeds on banana ; but all mine were found on cocoanut palm (*Cocos nucifera*), to which they were very injurious. Found at Honolulu, sewing together the leaves behind, in the folds, with bands of thread at intervals. Several larvæ together ; they eat at the top and finally spin cocoons at the base of the leaf. Head rounded, median suture not deep, clypeus and mouth-parts small ; minutely shagreened, not conspicuously ; setæ rather long ; dull white, sordid, almost testaceous, with six moderately large black spots on each lobe, one over ocelli, one above this in line with another near the top of the clypeus ; one above this latter and another very near the median suture ; two more below the vertex, elongate and almost contiguous, directed towards the side of head ; jaws pale brown, black at base and tip ; width 3 mm. Body elongate, slender, transparent and nearly colourless, the green food showing by transparency. Joint 13 divided by a moderately distinct suture. Tubercles i. to iii. large, almost perfectly flat, transparent ; subventral

tubercles smaller and indistinct. A pale yellow, double, dorsal line, edging the dorsal vessel; tracheæ white, showing by transparency; spiracles small, faintly yellowish; feet pale. Pupa cylindrical, slender, slightly tapering, the antennæ and leg-cases projecting beyond the wing-cases; cremaster conical, not much flattened, terminating in several recurved spines. Colour pale brown, darker in the abdominal sutures. Length 17, width 4 mm.

#### TORONTO BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The fifth annual meeting of the Toronto branch of the Entomological Society of Ontario was held on Friday evening, April 6th, in the Education Department. The chair was occupied by the Vice-President, Mr. E. M. Walker, and there was a good attendance of members. Four new names were proposed for membership. The President, Mr. Arthur Gibson, owing to his duties as assistant in the Division of Entomology at the Central Experimental Farm, Ottawa, was unable to be present, but sent his address. The report of the Council showed that the Branch had had a very successful year, fifteen meetings being held and a number of interesting papers contributed. Members of the Montreal Branch were thanked for the courteous exchange of papers with the Toronto Branch. The reports of the Librarian and Treasurer also showed the continued prosperity of the Branch. These reports, on motion, were received and adopted. The following officers were elected for the ensuing year:—D. G. Cox, President; E. M. Walker, Vice-President; G. M. Stewart, Secy.-Treasurer; H. C. Austen, Librarian; and R. J. Crew and C. H. Tyers, members of Council. The address of the retiring President was read by the Chairman, and reviewed the work of the Branch since its inception, particular mention being made of the year just ended. The members were urged to make extra efforts the coming summer to collect and mount specimens for the collection which the Branch is forming for the Education Department. The latter portion of the address took the form of a practical, illustrated paper on "The Preservation of Larvæ by Inflation."



## BOOK NOTICE.

TWENTY-THIRD REPORT ON OBSERVATIONS OF INJURIOUS INSECTS AND COMMON FARM PESTS DURING 1899.—By Eleanor A. Ormerod, LL.D., F. R. Met. Soc., etc.

Miss Ormerod's last Report, which is the first of a new series, has just come to hand. As usual, it is full of interest to the entomologist, and contains many valuable practical suggestions for the farmer and fruit-grower.

There were, during 1899, complaints of the depredations of the ordinary farm and orchard pests, and also of a few which had been little noticed previously. The value of Dr. Ormerod's Reports to Canadian readers is shown by the large number of injurious insects treated of, which are now common to both Europe and America, or are represented on one continent by species closely allied to kinds with similar habits found on the other.

Cabbage butterflies of three species were very prevalent and destructive. Dusting the plants with a mixture of lime and soot was found to be of no avail, while syringing them with Little's "Antipest" was satisfactory. There is no mention of the simple and very effective remedy of dusting the plants with insect powder and flour, which has been found by far the best remedy in this country. An account is given of good work in lessening injury by collecting the butterflies. This was by the boys at Mr. W. Bailey's Aldersey Grammar School, in Cheshire. In the previous year the boys turned their attention to the caterpillars, and from 240 plants they gathered more than 5,000 caterpillars.

The Cheese and Bacon Fly.—This is the parent of the well-known "skippers" in cheese. These larvæ are also frequently found injuring hams. The remedies proposed are all of a preventive nature, such as the close screening of windows in ham and cheese curing rooms to keep the flies from entering, the frequent rubbing and turning of cheeses during the egg-laying season, and the destruction of the flies in the curing rooms by means of pyrethrum insect powder or the ordinary fly paper. All cracks in cheese should be filled at once with a mixture of flour, butter and pepper.

Portions of cheese or ham that are found to be attacked, should be cut out as soon as possible after observation; and, with regard to cheese, it is recommended that after cutting out the piece, a thorough dusting of

black pepper should be given and the cavity refilled with cheese and covered carefully with calico.

**Leather Jackets.**—The larvæ of the Crane Flies or Daddy Long-legs as enemies of grain crops and grass are treated of, and the use of nitrate of soda as a quick-acting fertilizer is recommended.

The Hessian Fly occurred at one locality, and a full resumé of the subject, compiled chiefly from United States reports, presents the important characteristics of the attack and the best remedies, in an attractive manner. Stress is laid on the importance of destroying the "flaxseeds" both in screenings and in stubble.

The Currant Gall Mite, an enemy of the black currant, which yearly causes much loss, is still under observation, and some interesting new experiments are reported as to discovering the method of distribution of the mites. It was found that plants cut down to the ground could be moved from an infested plantation, and there was no conveyance of infestation in the earth at the roots.

**Flour and Grain Beetles.**—Under this heading several familiar insect enemies of stored grain are treated of, viz.: The Rust-red Flour Beetle, the Cadelle and the Mediterranean Flour Moth.

The Grouse Fly (a parasite on grouse), the Hop Flea-beetle and the Land Planarian are the subjects of articles of much scientific interest.

**Short Notices.**—A new feature of this second series of Dr. Ormerod's Reports is a collection of short notes, in which recently-discovered facts on the appearance, habits, treatment or remedial measures are given of insects previously referred to at length in former Reports. Here we find, among other things, a mention of the occurrence in England of our troublesome Canadian enemy of the apple, the Eye-spotted Bud-moth; also a recommendation of a caustic alkaline spraying mixture of crude potash and caustic soda; and an attack upon strawberries by three species of ground beetles, the worst culprit being the Red-horned Ground Beetle (*Harpalus ruficornis*).

This valuable Report of 152 pages is replete with useful and practical knowledge, which must of necessity be of enormous value to all who read it. The illustrations are excellent and the volume contains a most complete index, which much facilitates reference.

J. F.

Mailed May 4th, 1900.

